

# THE WEATHER AND CIRCULATION OF AUGUST 1962

## Another Cool Month in the North

L. P. STARK

Extended Forecast Branch, U.S. Weather Bureau, Washington, D.C.

### 1. MONTHLY CIRCULATION

Fundamental changes occurred in the 700-mb. circulation during August 1962. These changes resulted in a zonally oriented flow over most of the Northern Hemisphere in mid-latitudes (fig. 1), compared with more meridional flow in July [1]. Zonal characteristics of the August circulation are evident from the height anomalies which were generally greater than normal from 30° to 40° N. and less than normal from 50° to 60° N. This configuration implies a fast westerly flow in temperate latitudes as portrayed in figure 2, the profile of zonal flow north of 25° N. in the western portion of the Northern Hemisphere. Westerlies were strongest between 45° and 50° N. where they averaged 2.5 m.p.s. stronger than normal.

August was the first 30-day period (as computed twice monthly) since April during which the zonal index from 5° W. to 175° E. averaged above normal. In June and July, when strong blocking was dominant over North America and the Pacific, the zonal index averaged about 1 m.p.s. below normal. But in August, this index was 1 m.p.s. higher than normal and only residual blocking near Greenland remained.

Overall strengthening of the circumpolar westerlies from July to August and weakening of blocking is indicated by the continuous band of anomalous height decreases in high latitudes (fig. 3A). In middle latitudes height increases, though small, also contributed to the faster westerlies. Over the United States anomalous height changes were less than 100 ft., but there was, nonetheless, a decided surface temperature reaction (fig. 3B). Temperature anomalies became warmer over some two-thirds of the country, generally in areas where the height anomaly also increased. Cooling in the Gulf Coast States and in parts of the Northwest was correspondingly associated with areas where the height anomaly was becoming more negative.

Among other features of the 700-mb. circulation in August, the most notable was the particularly strong westerly flow in Europe and western Asia, shown by the dotted lines in figure 1. This mean flow was 6–8 m.p.s. faster than normal and was mostly a result of the deep cyclonic complex that extended from the eastern Atlantic into western Russia, and then to extreme northerly latitudes in Siberia. Unseasonably cool, wet weather in northern Europe was associated with the frequent cyclonic activity indicated by

TABLE 1. — *Temperature departures from normal and precipitation for selected cities in Europe in August 1962. (Preliminary teletypewriter reports.)*

City	Temperature departure (° F.)	Precipitation quintile*
Oslo.....	−5.0	5
Berlin.....	−4.0	4
Moscow.....	−4.1	5
Lisbon.....	+3.1	1
Marseilles.....	+2.2	1
Belgrade.....	+2.7	1

\*Based on division of long-period precipitation data at each city into 5 equally-frequent categories from 1 (least precipitation) to 5 (most precipitation).

the strong negative height anomaly. Meanwhile, much of southern Europe was warmer and drier than normal under the domination of a strong ridge aloft. (See table 1.)

The troughs in the eastern Atlantic and western Siberia were in areas of maximum climatological expectancy [2], but were unusually intense. From 5-day mean charts during the month it appears that the Atlantic trough frequently deepened in accompaniment to the blocking near Greenland.

In the Pacific a deeper than normal trough extended from the Bering Sea southwestward. This vigorous center of action accompanied limited amplification of the circulation in the Pacific. Downstream, shorter than normal wave spacing and deepening in the Gulf of Alaska occurred. The northern portion of the trough in the eastern Pacific was somewhat unusual since mean troughs in the Gulf of Alaska in August are uncommon. Troughs are much more frequent about 10° longitude farther east [2].

Compared with the rest of the hemisphere, the 700-mb. circulation over the United States was conspicuously weak. Note that the ridge along the Divide was barely of normal strength and the trough in the Eastern States was only slightly stronger than normal. 700-mb. heights in the United States did not deviate more than 70 ft. from normal, but compared with previous Augusts this was not too unusual a circumstance.

### 2. INTRAMONTHLY EVOLUTION

Half-monthly components of the circulation from the Atlantic to mid-Pacific indicate a typical sinusoidal wave pattern in the first half of August (fig. 4A), however, the



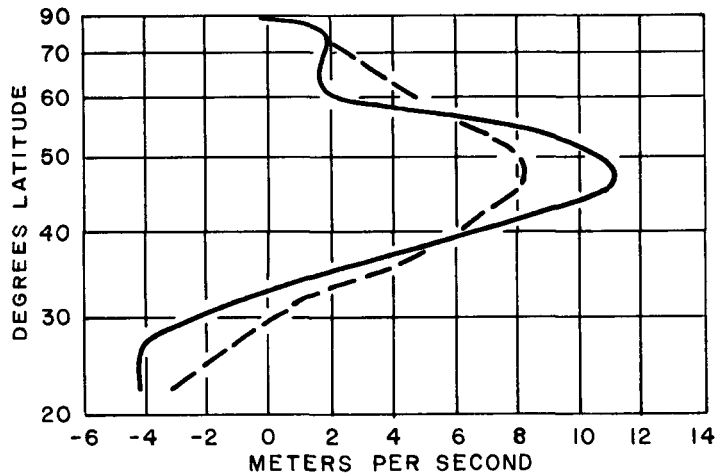


FIGURE 2.—Mean 700-mb. wind speed profiles for 5° W. to 175° E. long. for August 1962 (solid) and August normal (dashed). The westerlies were stronger than normal in middle latitudes.

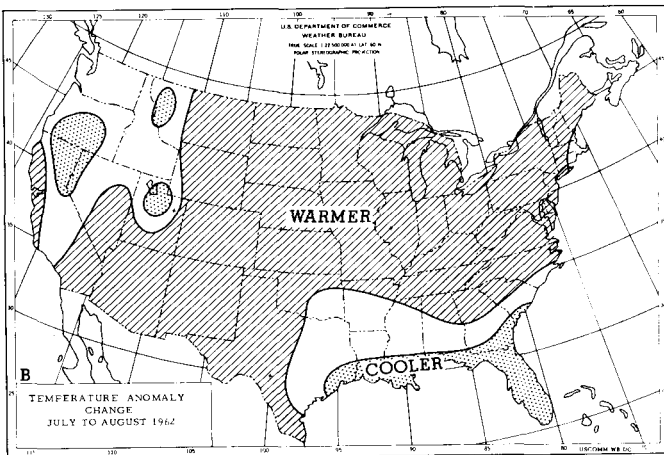
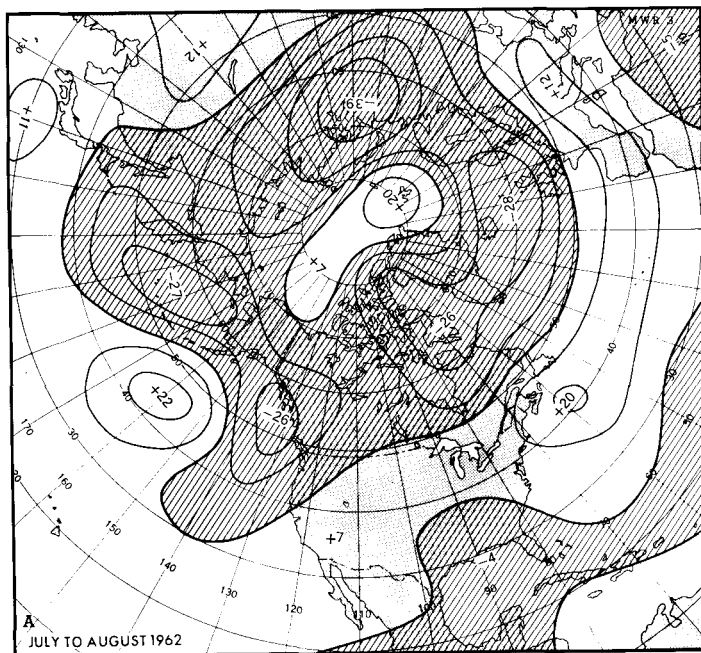


FIGURE 3.—(A) Mean 700-mb. height anomaly change, tens of feet, from July to August 1962, and (B) temperature anomaly class change July to August 1962. A warming trend in hatched area accompanied increased height anomaly.

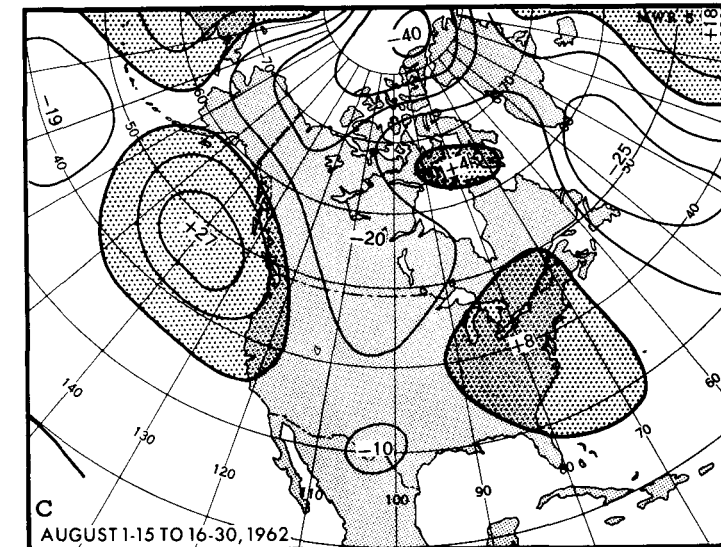
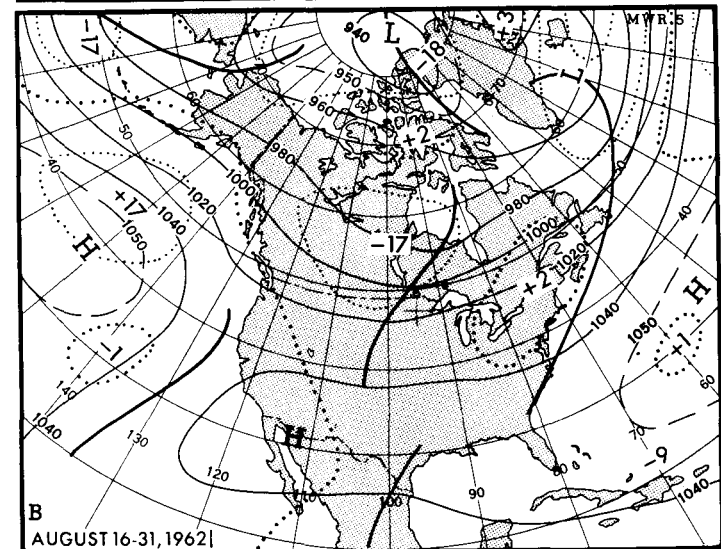
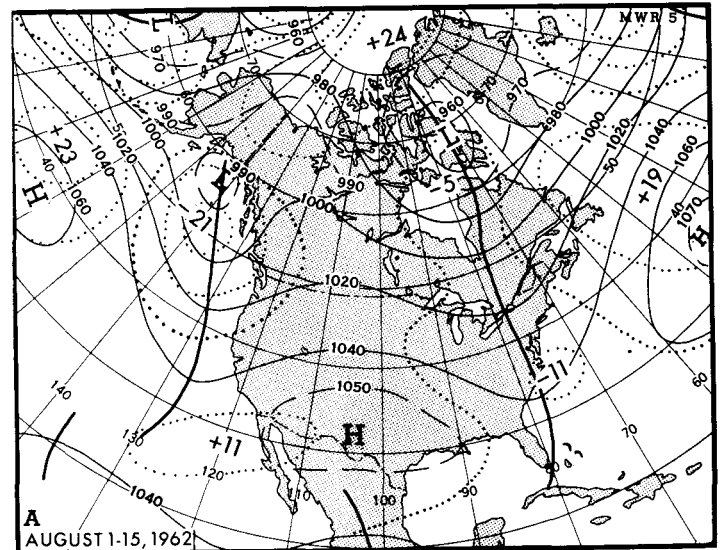


FIGURE 4.—Mean 700-mb. contours (solid) and height departures from normal (dotted), both in tens of feet, for (A) August 1-15, and (B) August 16-31, 1962. (C) Change in height from (A) to (B). Marked circulation changes in central North America were related to the large rises in the Gulf of Alaska.

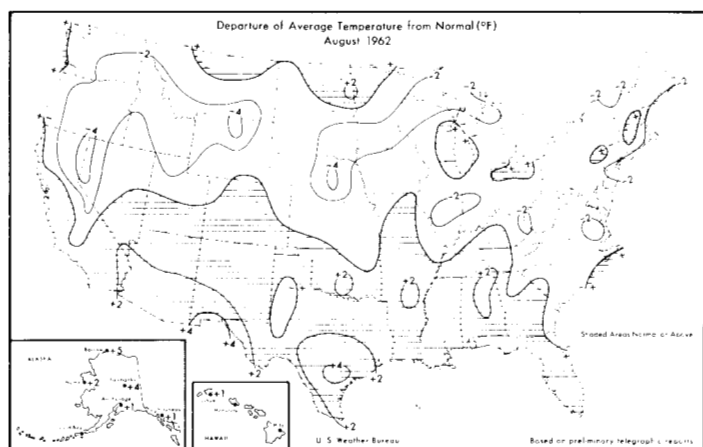


FIGURE 5.—Departure of average temperature from normal ( $^{\circ}$  F.) for August 1962. Warmth in the South and mild weather in the North typify the low-amplitude flow over the Nation. (From [5].)

Reno, Nev.; east of the Rockies warming predominated from the Central Plains to the east coast and was greatest in the central and upper Mississippi Valley. Half-monthly mean temperatures were lower by less than  $2^{\circ}$  F. in Montana and by as much as  $4^{\circ}$  F. in Texas and the Gulf Coast States.

### 3. MONTHLY TEMPERATURES

Subnormal temperatures dominated the northern half of the Nation in August (fig. 5), but in the South and Southwest it was hot, in some instances of record-breaking magnitude. Yuma and Tucson, Ariz., reported the hottest August of record. At the former station the average temperature for August was  $95.9^{\circ}$  F. and daily maximum temperatures were never less than  $103^{\circ}$  F. and ranged to  $117^{\circ}$  F. At Tucson temperatures averaged  $3.4^{\circ}$  F. higher than the normal of  $83.6^{\circ}$  F. Texas was another area of prolonged heat with all-time maximum temperatures recorded at Wichita Falls ( $111^{\circ}$  F.), Port Arthur ( $107^{\circ}$  F.), and Houston ( $106^{\circ}$  F.).

Lower than normal average temperatures were common over a wide area in the northern portion of the United States. Temperatures were not extreme, however, as there were only two new monthly records. Reno, Nev., had the coolest August of record, and at Casper, Wyo., the lowest August temperature of all time ( $36^{\circ}$  F.) was observed.

The correspondence between observed temperature (fig. 5) and that expected from the average circulation (fig. 1) is surprisingly good for a summer month. Local conditions (i.e., cloudiness and showers) frequently are of major consequence in summer, but during August 1962 the temperature anomaly distribution seemed to be directly attributable to the circulation pattern without considering the linkages with cloud and precipitation systems.

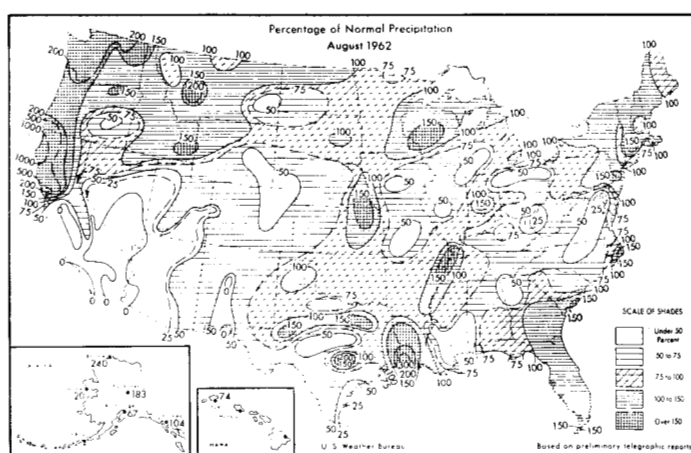


FIGURE 6.—Percentage of normal precipitation for August 1962. Rather dry conditions prevailed east of the Divide except for isolated areas of heavy rain. (From [5].)

Coolness in the North was associated with the negative height anomaly and was generally related to frequent anticyclones of Pacific origin, whose tracks did not penetrate far south (Chart VIII of [3]). Warmth in the Southwest and South was closely related to the anticyclonic flow aloft.

### 4. PRECIPITATION

Precipitation in August was sufficiently heavy in some areas to account for new records; in other areas it was so light (or nonexistent) that record dryness was observed.

Mostly normal and greater rainfall was reported along the northern tier of States (fig. 6). This was a result of a maximum frequency of cyclonic activity from the Northern Plains to the Maritime Provinces (Chart IX of [3]). Although the lower-level flow was southerly from the Central Plains eastward, widespread heavy rain was not implied by the flow at 700 mb. (fig. 1). This flow was predominantly anticyclonic and the anomalous component was northwesterly, which usually indicate subsidence or at least limited ascent. Consequently, rainfall exceeding normal was not widely observed. Above normal rainfall in the Northeast occurred under the favoring conditions of upper-level cyclonic flow and with southeasterly anomalous components.

Along the Pacific Coast considerable rain was associated with the mean trough and the strong onshore flow (fig. 1). New records for August precipitation were made at Olympia, Wash., Sexton Summit, Oreg., and Eureka, Calif.

The heaviest precipitation anywhere in the United States occurred at Lake Charles, La. In one deluge 14.10 in. of rain fell there in 24 hours, a record for August that was exceeded only in June 1947. The monthly total of 17.36 in. was also a record for any August.

The 6 to 10 in. of rain along the southeastern Atlantic

Coast was due to the proximity of several frontal waves and the passage of hurricane Alma.

### 5. DROUGHT

Substantial deficiencies of rainfall accumulated over many weeks in portions of the Northeast and the Southwest. Summer drought was confined to relatively small areas but in some instances it was approaching the critical stage before being eased in August.

In portions of the Northeast, drought conditions appear to have moved southward from May through August. Early in this period the driest area included eastern New York, northeastern Pennsylvania, and northern New Jersey. In July it was driest in New Jersey and eastern Pennsylvania. Then sufficient rainfall prior to mid-August dispelled the drought here just in time to prevent serious damage to crops.

In August, the drought shifted southward again, this time to affect parts of central Maryland, Delaware, and northern Virginia. The driest August of record was reported at several stations including Washington, D.C., and Baltimore, Md., both about 4½ in. deficient in rainfall. This lack of precipitation in August compounded pre-existing dryness where rainfall from mid-April to mid-August was 30–50 percent less than normal. Extensive damage to crops was prevented owing to the coolness through the summer that enabled plants to get maximum benefit from limited soil moisture.

In southern Texas a severe drought that lasted more than 7 weeks was relieved the last week of August. From the 24th to the 26th a summer “norther” that pushed through Texas was accompanied by heavy local showers. On two of these days Austin reported a total of 4.55 in. of rain following a record 55 consecutive days without rain. Other stations that had been rainless for more than 50 days include: San Antonio, Waco, and Corpus Christi.

Farther westward, areas that are normally dry were exceptionally so this August. El Paso and Albuquerque recorded only a trace of rain this month, the first August of record with no measurable precipitation. In Arizona, Flagstaff and Prescott had the driest August of record; at Winslow it was the driest April–August period and there was no measurable precipitation.

### 6. TROPICAL STORMS

There were three tropical storms in the North Atlantic in August, only one of which reached hurricane force. It appears that hurricane Alma evolved from an easterly disturbance near Florida on August 26. A low pressure area deepened as it moved northeastward and reached hurricane intensity well off the coast. There was little damage from wind or tides with only gale force winds recorded on land. At Cape Hatteras, the only land area in the path of the storm, rainfall exceeded 8 in. Rainfall attributed to the storm was otherwise about 2 in. along the coast, except in Virginia and Delaware where

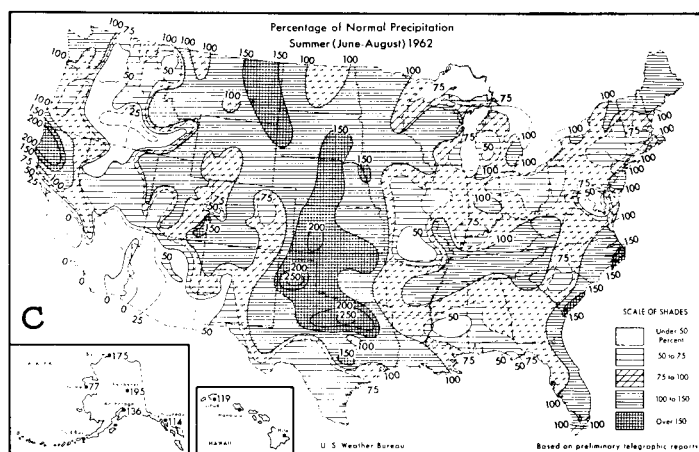
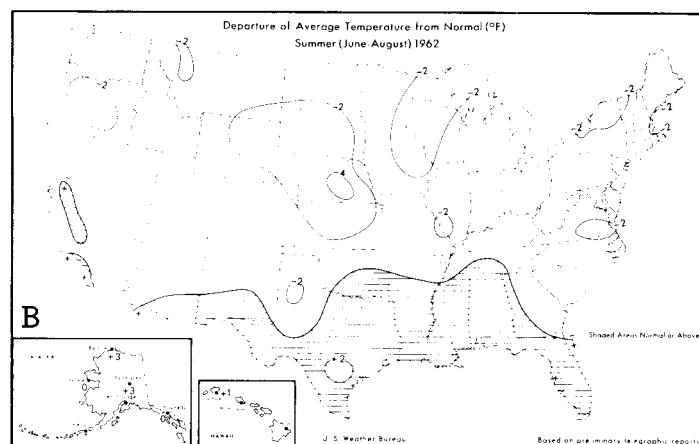
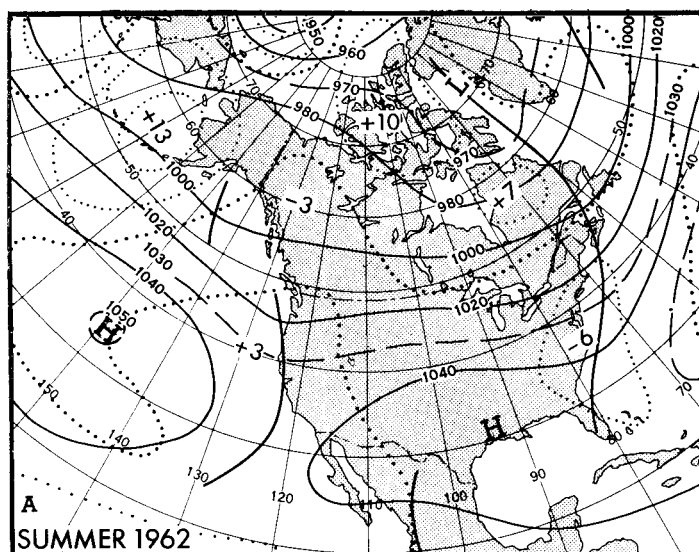


FIGURE 7.—(A) Mean 700-mb. contours (solid) and height departure from normal (dotted), both in tens of feet, for summer 1962. (B) Departure of average temperature from normal (°F.) for summer 1962. (C) Percentage of normal precipitation for summer 1962. Cool summer weather accompanied persistent blocking. (B and C from [5].)

it was less than 1 in. The other tropical storms were weak and of short duration and did not pose a threat to the United States.

The frequency of tropical activity in the western Pacific was about average for August. There were seven tropical storms in August but two of these started in July. All reached typhoon intensity, and of the five that formed in August, four recurved despite the relatively strong ridge along 30° N. south of Japan.

#### 7. SUMMER 1962

Rather strong, persistent blocking dominated the 700-mb. circulation immediately affecting North America this summer (June, July, and August) (fig. 7A). This is most clearly shown by the height anomaly pattern composed of a high-latitude arc of above normal heights from the Bering Sea to northern Canada, then southeastward to eastern Canada. In middle and lower latitudes over the United States, heights were lower than normal, except in the Far West. The 700-mb. contours suggest this blocking as a definite split in the westerlies beginning over the Bering Sea, one branch traversing high latitudes, the other along the band from 40° to 50° N.

Observed summer temperature departures (fig. 7B) were zonally distributed. Pleasantly cool summer weather ex-

tended from coast to coast except for the South where the weather was persistently warm.

Abundant precipitation fell in the Plains, the Pacific Coast States (except southern California), the Tennessee Valley, and coastal areas in the East. Serious drought threatened in parts of the Northeast and southern Texas, but rain in August brought some relief to these areas. Only Washington, D.C., reported the driest summer of record. In this area rainfall for the season was 4.62 in., only 38 percent of normal, which represents a deficiency of more than 12 in.

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